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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/580,560	05/26/2006	Koji Kudo	Q95169	5973

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EXAMINER	
NIU, XINNING	

ART UNIT	PAPER NUMBER
2828	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/580,560	KUDO ET AL.	
	Examiner	Art Unit	
	XNNING NIU	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 September 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,21 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,21 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/27/2008, 09/19/2008*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1, 2, 3, 6, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Chuang S. L., Physics of Optoelectronic Devices. New York: John Wiley & Sons, 1995 and Aoyagi et al. (2003/0091080).

4. Regarding claim 1, Itaya et al. disclose: a distributed feedback laser comprising an active region for generating the gain of a laser beam and a diffraction grating formed in said active region (page 829, Left column); front and back surfaces between which

said active region is interposed, wherein the front end surface has a reflectivity of 1 percent or less, the back end surfaces out of said two end surfaces has a reflectivity of 30 percent or more when viewed from the back end surface side toward the front (page 830, right column, page 831); the coupling coefficient κ of said diffraction grating is 100 cm^{-1} or more (page 829, left column), the length L of the active region is 150 μm or less (page 29, right column); using a small active region to achieve a lower threshold current (page 828, right column). Itaya et al. do not disclose: the threshold gain g_{th} is the sum of an internal loss and mirror loss. Chuang discloses: threshold gain g_{th} is the sum of an internal loss and mirror loss (assuming the optical confinement factor is equal to 1) (equation 10.1.19, page 399). It would have been obvious to one of ordinary skill in the art at the time the invention was made to define threshold gain as the sum of an internal loss and mirror loss since it is well known in the art.

5. Itaya et al. as modified do not disclose: a combination of κ and L so that these parameters provide $\Delta\alpha/g_{th}$ of 1 or more.

6. Aoyagi et al. disclose: DFB laser with a combination of κ and L so that these parameters provide $\Delta\alpha/g_{th}$ of 1 or more (Figure 4, [0052] [0064]); $\Delta\alpha th*L \geq 1$, $L \leq 260$ um, $7\ cm^{-1} \leq \alpha th \leq 51\ cm^{-1}$; if L is assumed to be 100um, then one can calculate the value of $\Delta\alpha/g_{th}$ to be greater than 1. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. by using a combination of κ and L so that these parameters provide $\Delta\alpha/g_{th}$ of 1 or more in order to achieve a stable single axial mode. The threshold gain (g_{th}) and the gain difference between modes (Δαth) of Aoyagi only takes into account the mirror loss and

not the internal loss. However, If the internal loss is considered for both terms, g_{th} would be greater due to the addition the internal loss; $\Delta\alpha th$ would vary depending on the design of the laser (higher for a better single mode laser). One of ordinary skill in the art would still find it obvious to choose a combination of κ and L so that $\Delta\alpha th/g_{th}$ is greater than 1 because a higher $\Delta\alpha th$ results in a better single mode laser and a lower g_{th} results in a lower threshold current for the laser.

7. Regarding claim 2, Itaya et al. disclose: the coupling coefficient κ of said diffraction grating is 100 cm^{-1} or more (page 829, left column), the length L of the active region is 150 μm or less (page 29, right column). Therefore, the product of the coupling coefficient and the active region length is at least 1 and not more than 3.

8. Regarding claim 3, Itaya et al. disclose the claimed limitations except active region length L is not longer Lp value, where the Lp value is the length of the active region at the peak of a curve of $\Delta\alpha/g_{th}$ vs. active region length. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. by modifying the active region length and grating in order to reduce the threshold current.

9. Regarding claim 6, Itaya et al. disclose: back end surface of the active region is formed by etching and the longitudinal direction length of the entire device including the distributed-feedback semiconductor laser is longer than 150 μm (page 830, Col 2).

10. Regarding claim 17, please see the rejection for claim 1.

11. Claims 4,5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Aoyagi et al. (2003/0091080), Chuang S. L., Physics of Optoelectronic Devices. New York: John Wiley & Sons, 1995 and McCall, Jr. et al. (4,740,987).

12. Regarding claims 4, 5, Itaya et al. as modified disclose the claimed limitation except: diffraction grating has a structure that is refractive index coupled and λ/4 shifted, and the λ/4 shift position is at a distance 75 percent along the length of the active region measured from the front facet. However, McCall, Jr. et al. disclose: quarter-wave phase slip introduced at a point in the grating (Col 2, Lines 49-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by introducing a quarter-wave phase slip in ordre to enhance mode selectivity.

13. Claims 7-15, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Chuang S. L., Physics

of Optoelectronic Devices. New York: John Wiley & Sons, 1995, Aoyagi et al. (2003/0091080) and Aoki. et al. (2003/0021319).

14. Regarding claim 7, Itaya et al. as modified disclose the claimed limitations except: laser device so structured to include another function region integrated behind the distributed feedback semiconductor laser through an end surface gap formed by said etching process. However, Aoki discloses: laser device in which laser back was prepared by using known dry etching techniques, and light output monitor (116) integrated with the laser (Figures 2, 3; 0026] [0227]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by Etching the laser and integrating a light output unit in order to monitor the output laser light.

15. Regarding claim 8, please see the rejection for claim 7.

16. Regarding claim 9, Itaya et al. as modified disclose the claimed limitations except: front end surface of said other function region is formed tilted relative to the back end surface of said active region. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by tilting the front end surface of the other function region in order to improve the coupling of light into the light receiving section.

17. Regarding claims 10, 21, the light receiving section (external reflector) is provided behind the distributed feedback laser and inherently reflects a portion of the light emitting by the laser.

18. Regarding claims 11 and 12, Aoki discloses: facet with high reflection film having a reflection factor of 97% ([0025]). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by forming an antireflection form with a higher reflection factor in order to reduce the threshold current.

19. Regarding claim 13, the back facet is formed on the high reflection film and is a window that guides light out of the active region.

20. Regarding claim 14, Itaya et al. as modified disclose the claimed limitations except: active region comprise at least one material selected form the group of Al, N and Sb. However, Aoki discloses: laser with active region comprising InGaAlAs. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by using the InGaAlAs material system and forming a DFB laser in order to modify the emission wavelength.

21. Regarding claim 15, Itaya et al. as modified disclose the claimed limitations except: distributed-feedback laser has a series resistance within a certain range. It

would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the resistance of the laser device, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233.

22. Claims 16, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Y. Itaya et al. "Low Threshold Current GaInAsP/InP DFB Laser," IEEE J. Quantum Electron, Vol. QE-23, NO. 6, June 1987, pp. 828-834 in view of Chuang S. L., Physics of Optoelectronic Devices. New York: John Wiley & Sons, 1995, Aoyagi et al. (2003/0091080), and Macomber et al. (5,610,930).

23. Regarding claims 16 and 23, Itaya et al. as modified disclose the claimed limitations except: a distributed feedback laser array wherein the distributed feedback semiconductor lasers have different wavelengths from each other. However, Macomber et al. disclose: DFB laser array emitting at different wavelengths (Figure 1, Col 5, Lines 18-35, Col 6, Lines 32-51). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the laser device of Itaya et al. as modified by incorporating it into an laser array of Macomber et al. in order to emit light at different wavelengths.

Response to Arguments

24. Applicant's arguments filed 09/19/2008 have been fully considered but they are not persuasive.

25. Regarding the Applicant's argument that the threshold gain (g_{th}) of Aoyagi corresponds to the mirror loss and not the sum of internal loss and the mirror loss as in amended claim 1. The Examiner agrees with the applicant that (g_{th}) of Aoyagi only takes into account the mirror loss and not the internal loss. The power gain difference between modes (Δαth) also only accounts for the mirror loss and not the internal loss. However, the Examiner does not believe that taking into account internal loss for both terms would change the goal of choosing a combination of κ and L so that Δαth/gth is greater than 1 because a higher Δαth results in a better single mode laser and a lower gth results in a lower threshold current for the laser. Also, one of ordinary skill in the art would still find it obvious to choose a combination of κ and L so that Δαth/gth is greater than 1 because of the advantages mentioned.

26. Regarding the Applicant's argument that the disclosure of Aoyagi cannot be used to evaluate the short cavity laser of the present invention. Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

Conclusion

27. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to XNNING NIU whose telephone number is (571)270-1437. The examiner can normally be reached on M-T, 7:30-5:00 EST, Alternate Fridays 7:30-4:00 ES.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Min Sun Harvey can be reached on (571) 272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Xinning(Tom) Niu/
Examiner, Art Unit 2828
12/16/2008

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